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Producing Chitosan Based on Insect Derivatives From Soldier Fly Larvae Pre-Pupae Stage (*Hermetia Illucens*)

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Annotation. This study examines chemical methods for the extraction of chitin and its derivatives. The purpose of neutralizing this thesis is to consider the methods of extraction of chitin and chitosan to compare the optimal processing methods of demineralization, deproteinization, and deacetylation to optimize the yield and quality of chitosan from soldier fly larvae pre-pupae stage.

Introduction: Chitin is the most abundant amino-polysaccharide polymer found in nature and is a building material that gives strength to the exoskeletons of crustaceans, insects, and fungal cell walls. Through enzymatic or chemical deacetylation, chitin can be converted to its most famous derivative, chitosan. Chitosan is the second most widespread natural polymer in the world after cellulose; it mainly consists of glucosamine and N-acetylglucosamine residues with a 1,4-β bond. Chitosan is considered the most promising material for future applications due to its excellent biodegradability, biocompatibility, antimicrobial activity, non-toxicity, and economic aspects. Currently, chitin and chitosan are obtained from the black lion fly (*Hermetia illucens*) by efficiently converting the residual biomass into a valuable source of biomolecules such as proteins, lipids, and chitin.

Chitosan production is mainly divided into three main areas: industrial, food and pharmaceutical. The unique properties of chitosan are the driving forces behind the growing market for chitosan. Currently, the chitosan market is associated with the cultivation of shrimp, which entails the establishment of rules and regulations and influences the growth of the chitosan market. Consequently, chitosan market participants are exploring new ways of producing chitosan from non-aqueous sources. Insects since ancient times are valuable food: about 2 billion people worldwide consume 1900 different species of insects in their daily diets. The main insects for food live in Southeast Asia, the Pacific region, sub-Saharan Africa, and Latin America. On average, insects are composed of 30–45% protein, 25–40% fat and 10–15% chitin.

Main part: Chitosan is obtained as a result of deacetylation of chitin and has widely valuable chemical, physical and biological properties that determine its use in many fields, including medicine. It is obtained from chitin by alkaline hydrolysis, while chitin is mainly obtained from shells of crustaceans, insects and molluscs, as well as from the cell cells of bacteria and fungi. There is research on the use of chitosan in food (for example, as a coating agent), which has several advantages, such as delayed ripening of fruits, inhibition of water loss and restriction of respiration in plant products after harvest. Moreover, chitosan may be introduced as a functional food product due to its emulsifying properties, ability to stabilize the color and texture of the product. However, at least 50% deacetylation of chitosan is required for the material to be classified as chitosan.

Deacylation is an important factor that determines the functional properties of chitosan. Research describes the extraction of chitin from insects and its subsequent transformation into chitosan. The degree of deacetylation provides important information about the solubility of chitosan, which is necessary to optimize the manufacturing process and the possibility of modifying the reactive amino group. **Findings:** This study uses various defatting methods to extract chitosan from fly larvae such as chloroform and methanol ($CHCl_3:CH_3OH$) (7:3), petroleum ether, as well as the different concentration of NaOH and KOH used for the purpose of deproteinization and deacetylation to assess the effective method, solvent and concentration suitable for quality and yield of chitosan from fly larvae pre-pupae.

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